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AUTHOR Brigman, S. Leellen
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ABSTRACT

The 4,987 freshmen who entered the Bloomington campus of Indiana University in the fall of 1977 were used to establish two schemes for predicting first-semester grade point averages. Three sets of prediction equations and a graphic scheme for determining probable grade point averages were provided. Entering freshmen norms were included for SAT scores, high school rank, and first-semester college grade point averages. When compared to the national norms on the SAT provided by the College Entrance Examination Board for the 1977 college-bound candidates, the average entering freshman at Indiana University scored slightly higher on both the SATV and SATM, and, on the whole, the Indiana University students were more homogeneous than the national group. Statistical tables are included in the report. (Author/LBH)

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*Prediction of Grade Point Average
(GPA) and Normative Data
for University Freshmen*

INDIANA STUDIES IN HIGHER EDUCATION

Number Thirty-Eight

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INDIANA UNIVERSITY 1978

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PREDICTION OF GRADE POINT AVERAGE (GPA)
AND NORMATIVE DATA FOR UNIVERSITY FRESHMEN

S. LEELEN BRIGMAN

INDIANA STUDIES IN HIGHER EDUCATION
NUMBER THIRTY-EIGHT

BUREAU OF EVALUATIVE STUDIES AND TESTING
DIVISION OF RESEARCH AND DEVELOPMENT
INDIANA UNIVERSITY
BLOOMINGTON, INDIANA
NOVEMBER 1978

Abstract

The 4987 freshmen who entered the Bloomington campus of Indiana University in the Fall of 1977 were used to establish two schemes for predicting first semester grade point averages. Three sets of prediction equations and a graphic scheme for determining probable grade point averages were provided. Entering freshmen norms were included for SAT scores, high school rank, and first semester college grade point averages.

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Introduction

In 1961, The Bureau of Educational Studies and Testing* published the first in a series of monographs on the prediction of Fall Semester grade point averages for freshmen who enter the Bloomington campus of Indiana University (I.U.B.). Following the traditional procedures in predicting grade point averages, the scores on the College Entrance Examination Board's Scholastic Aptitude Test (SAT) and a measure of high school achievement, relative high school rank in the graduation class (RHSR), were employed as predictor variables. The primary purpose of these publications was to provide information for advising prospective students concerning the probability of success in the college curriculum at I.U.B.

Because of the changing characteristics of student populations, grading systems and the relationships among the variables, the original study was updated in 1965, 1970, 1973, and 1975. This monograph is the sixth in the series. It is based on the admissions data and first semester grades of 4987 freshmen who entered the Bloomington campus in the Fall of 1977.

This monograph provides two schemes for predicting first semester grades and normative information on SAT scores, RHSR, and GPAs obtained by freshmen during their first semester at I.U.B. This publication is primarily developed for professional use by high school and college admission counselors, and the academic advisors, faculty and administrators of Indiana University.

The Data Base

All students who apply for admissions to Indiana University-Bloomington are required to take the Scholastic Aptitude Test (SAT). The two scores obtained on this test are measures of verbal aptitude (SATV) and mathematical aptitude (SATM). Each of these measures is reported on a scale of 200 to 800. The two scores on the SAT may be summed to yield a total score (SATSUM) which ranges from 400 to 1600.

A second measure used in the prediction of first semester GPAs is one of previous academic success, relative high school rank (RHSR). RHSR incorporates an adjustment for the variation

*Presently the Bureau of Evaluative Studies and Testing.

in the size of high schools that entering freshmen attended. To obtain RHSR, a student's rank in the high school graduation class (HSR) is divided by the size of the high school graduation class (HSS). The resulting proportion is multiplied by 100 and rounded to a whole number. The formula for relative high school rank is

$$\text{RHSR} = \frac{\text{HSR}}{\text{HSS}} \times 100.$$

Thus, a RHSR of 21 indicates that a student was ranked in the top 21 percent of his/her graduation class.

The criterion for the prediction schemes is first semester grade points (GPA). It is reported on a four-point scale where A=4.00, B=3.00, C=2.00, D=1.00 and F=0.00.

Equations for Predicting Grade Point Averages

Three equations are provided in Table 1 for predicting first semester GPAs of females and males. In these equations SATs and/or RHSR are combined for the optimum accuracy in predicting a student's GPA. The equations may be used by admissions officers in identifying and admitting those applicants who are most likely to succeed in the college curriculum at I.U.B.

The first set of equations in Table 1 provides the best prediction of first semester grades because they combine the information on SATs and RHSR. However, some applicants do not provide both SATs and high school data. Therefore the second set of equations can be applied in the case where an applicant has provided only their SAT scores. The last set of equations are applicable when only the high school data is available for a prospective student. To determine the predicted grade point average (PGPA), substitute a student's SATs and/or RHSR into the appropriate equation.

The standard error of estimate (Sest) for each equation is also provided in Table 1. The Sest is provided to indicate the degree of error/accuracy in the predictions. Approximately sixty-eight percent of all students can be expected to obtain a GPA within one Sest of the predicted GPA.

Descriptive statistics for the measures in the prediction equations are provided in Table 2. Only students who had information on all measures were used in obtaining the prediction equations and the descriptive statistics. For each possible predictor variable (SATV, SATM, SATSUM, RHSR), the correlation coefficient and the percentage of GPA variance indicate the degree that a variable is associated with academic achievement in college (GPA). The multiple correlations of SATV, SATM and RHSR are included in Table 2.

Table 1
Three Equations for Predicting First Semester
Grades at Indiana University-Bloomington

GROUP	EQUATION				S _{est}
	Prediction with Relative Rank (RHSR) and SATs				
Female	PGPA=1.677366-0.014480	RHSR+0.001190	SATV+0.001682	SATM	.62
Male	PGPA=1.773788-0.014106	RHSR+0.001354	SATV+0.001197	SATM	.66
Prediction with SATs only					
Female	PGPA=0.671098+0.001718	SATV+0.002609	SATM		.66
Male	PGPA=0.476520+0.001973	SATV+0.002342	SATM		.71
Prediction with Relative Rank only					
Female	PGPA=3.189977-0.021450	RHSR			.66
Male	PGPA=3.194481-0.019586	RHSR			.69

Table 2
Descriptive Statistics on Entering Freshmen
in Fall 1977 at Indiana University-Bloomington

Group	Variable	Mean	Standard Deviation	Correlation with GPA	% of GPA Variance
Females (N=2274)	SAT Verbal	460	95.5	0.42	18
	SAT Mathematics	479	99.9	0.47	22
	SAT-SUM	939	174.7	0.50	25
	RHSR	22.4	17.8	-0.51	26
	GPA	2.71	0.76	--	--
	Combination of SATV, SATM and RHSR			0.58	34
Males (N=1974)	SAT Verbal	461	92.5	0.40	16
	SAT Mathematics	529	102.0	0.43	19
	SAT-SUM	990	172.7	0.47	22
	RHSR	29.2	21.0	-0.51	26
	GPA	2.62	0.80	--	--
	Combination of SATV, SATM and RHSR			0.56	32

Graphs for Predicting Grade Point Averages

The purpose of the present section is to provide an alternative scheme for estimating a student's likely achievement at Indiana University. The most useful interpretation of predicted grade point average (PGPA) is in terms of a range of GPAs which the student is most likely to obtain during his/her first semester at I.U. The following procedure provides an advisor with a quick method of obtaining the probabilities of a student achieving in the different GPA ranges provided. The advisor who uses this procedure does not need to employ the equations in Table 1 to obtain the probability of success for a prospective or new student.

There are five steps in determining for a student the probabilities of achieving the various GPA categories during his/her first semester.

- Step 1: Select the appropriate figure corresponding to the student's sex, Figure 1 for males or Figure 2 for females. Two measures, SATSUM and the measure of high school rank (RHSR) are used to enter the figures.
- Step 2: SATSUM is located on the horizontal axis of the figure and ranges from 400 to 1600. Move along the horizontal axis to the point that most closely corresponds to the student's SATSUM.
- Step 3: Compute the student's RHSR expressed on a decile scale (DHSR) which ranges from 1 to 10. Using a student's high school rank (HSR) and high school size (HSS), DHSR is equal to $\text{HSR} \div \text{HSS} \times 10$ [round the resulting value]. Move down the vertical axis to the point that most closely corresponds to a student's DHSR.
- Step 4: Locate the point on the figure where these two values (SATSUM and DHSR) intersect. This point will be in one of the four probability letter groups -- Q, R, S, or T. Determine the student's probability letter group. Consider both probability letter groups for borderline cases.
- Step 5: Refer to Table 3 to obtain the probabilities for the various GPA categories. Locate the column for the student's probability letter group in the table. Under the column label for the appropriate sex, read the probabilities for each GPA category.

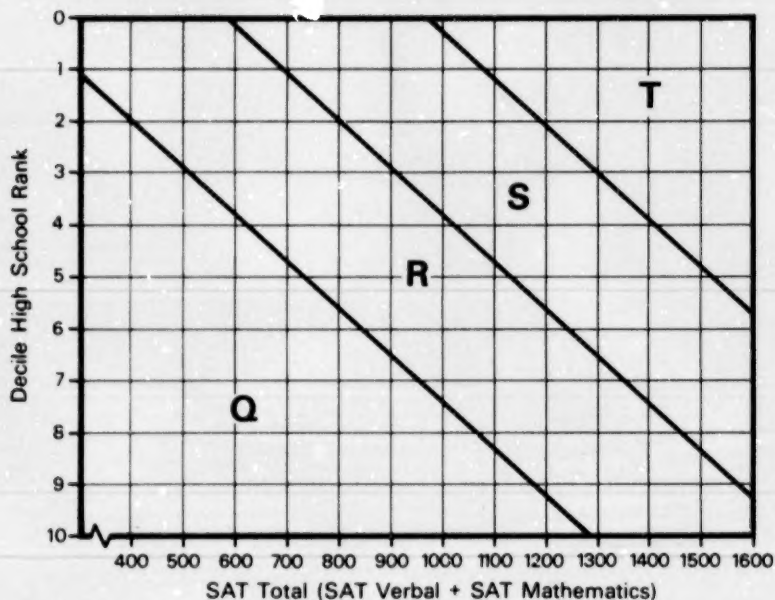


Figure 1. Predicted achievement categories for males.

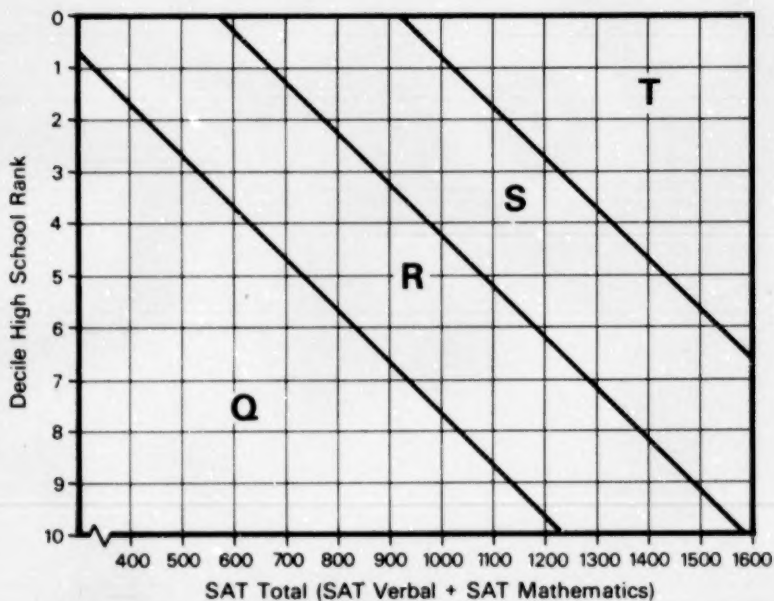


Figure 2. Predicted achievement categories for females.

Example

Shirley has a SATSUM of 950 (SATV=520 and SATM=430) and a DHSR of 3.2, placing her in probability letter category S of Figure 2. Referring to the column labeled S for females in Table 3, we find that 1.0 percent of females like Shirley obtained GPAs below 1.00, 8.3 percent obtained GPAs between 1.00 and 1.99, 55.5 percent between 2.00 and 2.99, and 35.3 percent between 3.00 and 4.00. In the second part of Table 3 we find that 90.8 percent of the females like Shirley obtained a first semester GPA of 2.00 or higher.

Table 3

Percent of Students in Each Letter Category (Q, R, S, or T)
According to GPA's Obtained during their First Semester
at Indiana University-Bloomington

Obtained First Semester GPA	Predicted First Semester GPA Category							
	Q		R		S		T	
	Males	Females	Males	Females	Males	Females	Males	Females
3.00-4.00	2.3	3.8	13.9	13.0	38.8	35.3	71.3	75.0
2.00-2.99	46.2	50.8	55.7	52.4	48.4	55.5	25.2	21.3
1.00-1.99	38.7	38.6	25.1	27.5	10.9	8.3	3.3	3.3
0.00-0.99	12.7	6.8	5.4	7.1	1.9	1.0	0.2	0.5
2.00 and Above	48.5	54.6	69.6	65.4	87.2	90.8	96.5	96.3
Below 2.00	51.4	45.4	30.5	34.6	12.8	9.3	3.5	3.8

If assistance is needed in the use of the prediction schemes or in the interpretation of the predicted grade point average, please call the Bureau of Evaluative Studies and Testing (Phone: 812/337-1595).

Normative Data

Distributions of RHSR, SAT scores, and first semester grades (GPAs) are presented in Tables 4-8. The distributions are presented for males, females and for the total group. Advisors who wish to evaluate an individual's RHSR, SATV, SATM or SATSUM in relationship to entering freshmen on the

Bloomington campus of Indiana University, can do so by referring to the appropriate normative group in Tables 4-7. Table 8 provides information on the GPAs obtained by entering freshmen in Fall Semester 1977. The data in Table 8 may be used to interpret GPAs and predicted GPAs.

Summary and Discussion

The primary purpose of the present monograph is to provide an update in the series of studies by the Bureau of Evaluative Studies and Testing on the prediction of Fall Semester GPAs. The sample for the present study consisted of 4987 freshmen who entered the Bloomington campus of Indiana University in the Fall of 1977. SAT scores and/or relative high school rank (RHSR) are used to predict first semester GPAs. Three sets of equations for predicting GPAs are provided in Table 1. In terms of academic achievement, females were slightly more predictable than the males. The difference in predictability is reflected in the standard error of estimate (S_{est}) in Table 1 and the multiple correlations in Table 2. The most important single predictor of GPA for males and for females is RHSR.

An alternative procedure for evaluating the probable success of a student at I.U. during his/her first semester is provided in the section entitled Graphs for Predicting Grade Point Averages. By using Figure 1 or Figure 2 and the information provided in Table 3, an advisor may estimate the probabilities of a student obtaining GPAs in various ranges.

In addition to providing prediction schemes, the present monograph includes local normative data on SATV, SATM, SATSUM, RHSR, and first semester GPA. For the 1977 entering freshmen, males and females were equal on SATV, but the males averaged 49 points higher than females on SATM. The average entering female ranked 7 percent higher in her high school graduation class and obtained a higher first semester GPA than the average entering male.

When compared to the national norms on the SAT provided by the College Entrance Examination Board for the 1977 college bound candidates, the average entering freshman at I.U. scored slightly higher on both the SATV and SATM (see Table 9). Also, the I.U. students as a whole were more homogeneous than the national group.

Table 4

Normative Data on the Relative High School Rank of Entering Freshmen
at Indiana University-Bloomington in Fall Semester 1977

Relative High School Rank	Decile High School Rank	MALES		FEMALES		TOTAL	
		N of Cases in Category	% Below Category	N of Cases in Category	% Below Category	N of Cases in Category	% Below Category
0 - 5	1	264	88	455	82	719	85
6 - 10		240	77	339	68	579	72
11 - 15	2	190	68	300	56	490	62
16 - 20		181	60	250	46	431	53
21 - 25	3	165	52	246	36	411	44
26 - 30		180	44	196	29	376	36
31 - 35	4	172	36	142	23	314	29
36 - 40		151	29	136	18	287	23
41 - 45	5	137	23	120	13	257	18
46 - 50		125	17	106	6	231	13
51 - 55	6	84	14	63	6	147	10
56 - 60		76	10	46	4	122	7
61 - 65	7	65	7	40	2	105	5
66 - 70		51	5	23	2	74	3
71 - 75	8	37	3	17	1	54	2
76 - 80		23	2	15	--	38	1
81 - 85	9	21	1	4	--	25	--
86 - 90		12	--	0	--	12	--
91 - 95	10	5	--	2	--	7	--
96 - 100		4	--	2	--	6	--
NUMBER		2183		2502		4685	
MEAN		29.8		22.6		25.9	
MEDIAN		26.8		18.2		21.8	
STANDARD DEVIATION		21.2		18.0		19.9	

Table 5

Normative Data on the Scholastic Aptitude Test-Verbal Scores of Entering Freshmen
at Indiana University-Bloomington in Fall Semester 1977

Scores	MALES		FEMALES		TOTAL	
	N of Cases in Category	% Below Category	N of Cases in Category	% Below Category	N of Cases in Category	% Below Category
781 - 800	0	--	0	--	0	--
761 - 780	1	--	1	--	2	--
741 - 760	2	--	2	--	4	--
721 - 740	3	--	9	--	12	99
701 - 720	6	--	12	99	18	99
681 - 700	19	99	19	98	38	98
661 - 680	18	98	27	97	45	97
641 - 660	20	97	25	96	45	96
621 - 640	43	95	45	94	88	95
601 - 620	51	92	68	92	119	92
581 - 600	63	90	61	89	124	89
561 - 580	74	86	92	86	166	86
541 - 560	84	82	118	81	202	82
521 - 540	133	76	131	75	264	76
501 - 520	122	71	119	71	241	71
481 - 500	151	64	183	63	334	64
461 - 480	198	55	181	56	379	55
441 - 460	199	46	209	48	408	47
421 - 440	177	38	204	39	381	39
401 - 420	180	29	229	30	409	30
381 - 400	185	21	221	21	406	21
361 - 380	123	15	131	16	254	16
341 - 360	94	11	137	10	231	11
321 - 340	86	7	101	6	187	7
301 - 320	67	4	65	4	132	4
281 - 300	45	2	38	2	83	2
261 - 280	17	1	21	1	38	1
241 - 260	11	--	14	1	25	1
221 - 240	4	--	11	--	15	--
201 - 220	3	--	7	--	10	--
200	3	--	2	--	5	--
NUMBER	2182		2483		4665	
MEAN	460		460		460	
MEDIAN	456		451		454	
STANDARD DEVIATION	93		96		95	

Table 6

Normative Data on the Scholastic Aptitude Test-Mathematics Scores of Entering Freshmen
at Indiana University-Bloomington in Fall Semester 1977

Scores	MALES		FEMALES		TOTAL	
	N of Cases in Category	% Below Category	N of Cases in Category	% Below Category	N of Cases in Category	% Below Category
781 - 800	3	--	2	--	5	--
761 - 780	7	--	5	--	12	--
741 - 760	21	99	5	--	26	99
721 - 740	19	98	6	99	25	98
701 - 720	44	96	13	99	57	97
681 - 700	43	94	13	98	56	96
661 - 680	80	90	37	97	117	94
641 - 660	78	86	52	95	130	91
621 - 640	83	83	64	92	147	88
601 - 620	135	76	88	89	223	83
581 - 600	155	69	112	84	267	77
561 - 580	153	62	105	80	258	72
541 - 560	139	56	155	74	294	65
521 - 540	152	49	149	68	301	59
501 - 520	163	42	168	61	331	52
481 - 500	147	35	187	53	334	45
461 - 480	149	28	182	46	331	38
441 - 460	133	22	210	37	343	30
421 - 440	113	17	150	31	263	24
401 - 420	113	12	163	25	276	19
381 - 400	69	8	156	18	225	14
361 - 380	59	6	116	14	175	10
341 - 360	42	4	124	9	166	6
321 - 340	26	3	99	5	125	4
301 - 320	17	2	44	3	61	2
281 - 300	22	1	43	1	65	1
261 - 280	12	--	20	1	32	--
241 - 260	3	--	8	--	11	--
221 - 240	2	--	5	--	7	--
201 - 220	0	--	1	--	1	--
200	0	--	1	--	1	--
NUMBER	2182		2433		4665	
MEAN	528		479		502	
MEDIAN	528		478		500	
STANDARD DEVIATION	103		100		104	

Table 7

Normative Data on the Scholastic Aptitude Test-Total Scores of Entering Freshmen
at Indiana University-Bloomington in Fall Semester 1977

Scores	MALES		FEMALES		TOTAL	
	N of Cases in Category	% Below Category	N of Cases in Category	% Below Category	N of Cases in Category	% Below Category
1561 - 1600	0	--	0	--	0	--
1521 - 1560	1	--	0	--	1	--
1481 - 1520	3	--	1	--	4	--
1441 - 1480	6	--	3	--	9	--
1401 - 1440	7	99	8	--	15	99
1361 - 1400	21	98	13	99	34	99
1321 - 1360	29	97	25	98	54	98
1281 - 1320	42	95	29	97	71	96
1241 - 1280	55	92	52	95	107	94
1201 - 1240	74	89	65	92	139	91
1161 - 1200	111	84	90	88	201	86
1121 - 1160	136	78	99	84	235	81
1081 - 1120	152	71	123	80	275	76
1041 - 1080	167	63	157	73	324	68
1001 - 1040	186	55	165	67	351	61
961 - 1000	186	46	210	58	396	52
921 - 960	183	38	223	49	406	44
881 - 920	189	29	218	40	407	35
841 - 880	167	21	239	31	406	26
801 - 840	149	15	189	23	338	19
761 - 800	109	10	175	16	284	13
721 - 760	78	6	147	10	225	8
681 - 720	60	3	109	6	169	5
641 - 680	28	2	61	3	89	3
601 - 640	21	1	32	2	53	2
561 - 600	11	--	29	1	40	1
521 - 560	7	--	12	--	19	--
481 - 520	4	--	6	--	10	--
441 - 480	0	--	2	--	2	--
401 - 440	0	--	1	--	1	--
NUMBER	2182		2483		4665	
MEAN	988		940		962	
MEDIAN	981		928		954	
STANDARD DEVIATION	174		175		176	

Table 8

Normative Data on the First Semester Grades of Entering Freshmen
at Indiana University-Bloomington in Fall Semester 1977

GPA	MALES		FEMALES		TOTAL	
	N of Cases in Category	% Below Category	N of Cases in Category	% Below Category	N of Cases in Category	% Below Category
4.00	28	99	33	99	61	99
3.90 - 3.99	37	97	40	97	77	97
3.80 - 3.89	48	95	67	95	115	95
3.70 - 3.79	55	93	89	91	144	92
3.60 - 3.69	73	90	91	88	164	88
3.50 - 3.59	66	87	100	84	166	85
3.40 - 3.49	95	82	114	80	209	81
3.30 - 3.39	103	78	110	75	213	76
3.20 - 3.29	91	74	112	71	203	72
3.10 - 3.19	104	69	125	66	229	68
3.00 - 3.09	119	64	140	61	259	62
2.90 - 2.99	95	60	113	56	208	58
2.80 - 2.89	116	55	134	51	250	53
2.70 - 2.79	100	51	131	46	231	48
2.60 - 2.69	118	46	148	40	266	43
2.50 - 2.59	107	41	120	36	227	38
2.40 - 2.49	107	36	121	31	228	34
2.30 - 2.39	103	32	98	28	201	29
2.20 - 2.29	99	27	102	24	201	25
2.10 - 2.19	78	24	90	20	168	22
2.00 - 2.09	83	20	98	16	181	18
1.90 - 1.99	64	18	60	14	124	16
1.80 - 1.89	66	15	52	12	118	13
1.70 - 1.79	33	13	48	10	81	12
1.60 - 1.69	41	11	39	9	80	10
1.50 - 1.59	39	10	36	7	75	8
1.40 - 1.49	22	9	17	7	39	8
1.30 - 1.39	26	8	25	6	51	7
1.20 - 1.29	32	6	17	5	49	6
1.10 - 1.19	18	5	22	4	40	5
1.00 - 1.09	25	4	19	4	44	4
.01 - .99	69	1	67	1	136	1
0	30	--	23	--	53	--
NUMBER	2290		2601		4891	
MEAN	2.60		2.70		2.65	
MEDIAN	2.68		2.77		2.73	
STANDARD DEVIATION	.83		.79		.81	

Table 9

Indiana University and National Norms (1977)
on the Scholastic Aptitude Test

Test	Indiana University Entering Freshmen		National College Bound	
	FEMALES	MALES	FEMALES	MALES
SAT-VERBAL	460 (96)*	460 (93)	425 (110)	433 (110)
SAT-MATH	479 (100)	528 (103)	444 (110)	494 (121)

*Standard deviations in parentheses.